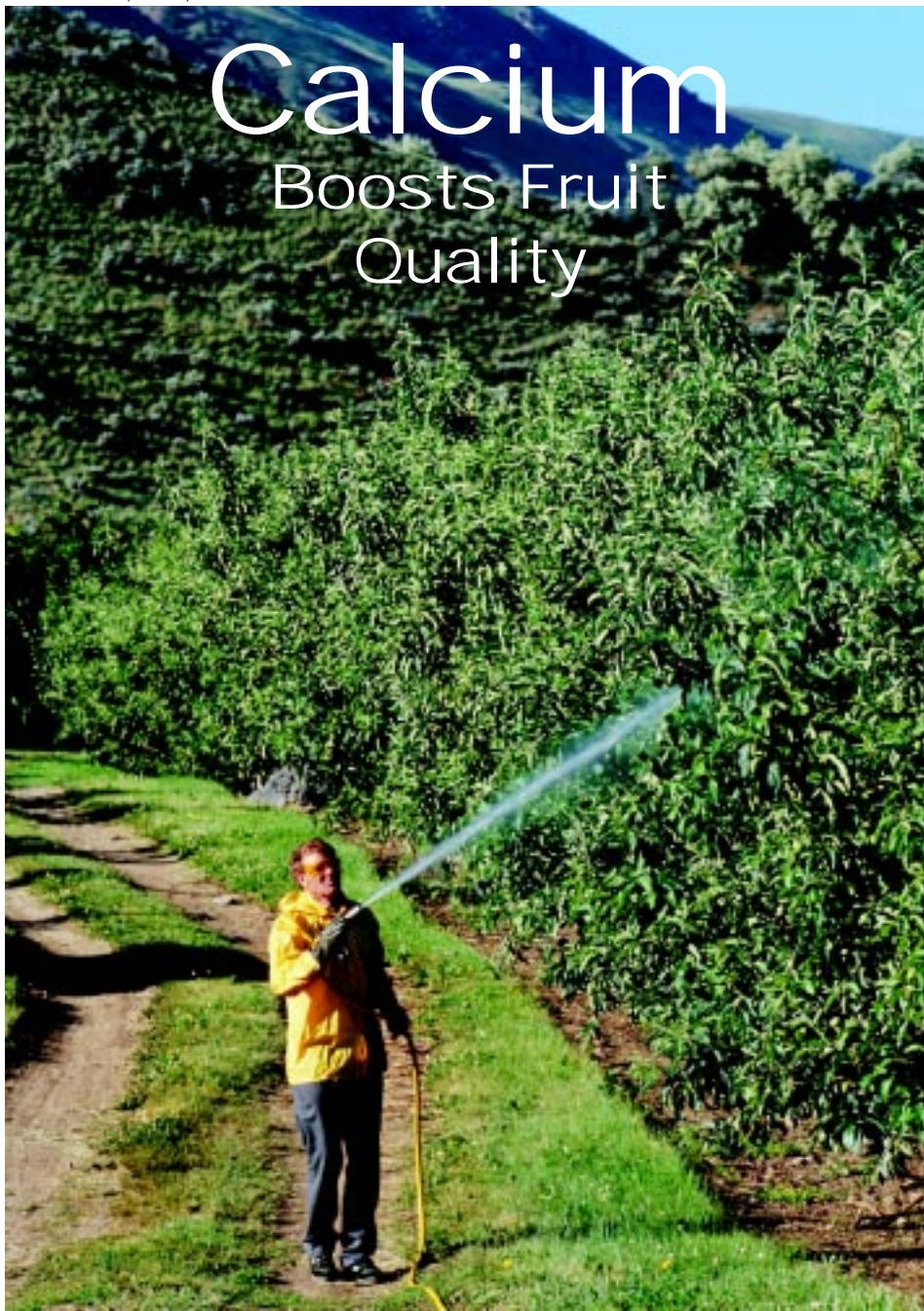


Calcium

Boosts Fruit Quality



Technician Dwayne Visser applies calcium spray to Granny Smith apples for control of bitter pit and internal breakdown.

Fruit disorders in apples and pears once cost the industry several millions of dollars in losses annually.

Washington State's rural areas were especially hard hit. Today, those orchards produce nearly half of all apples grown in the United States, worth around \$1 billion each year.

Of the commercial fruit producers in the Pacific Northwest, most now spray their apple and pear trees with calcium chloride or calcium nitrate. Cost can be as low as 22 cents per tree per year for labor and calcium. Some varieties need only 3 or 4 treatments; others, 6 or 7.

This very cost-effective technique developed by Agricultural Research Service scientists at Wenatchee, Washington, reduces incidence of bitter pit, cork spot, alfalfa greening, and internal breakdown—four quality factors that render some apples and pears unmarketable.

On d'Anjou pear trees, the sprays increased yield by an annual average of 16 to 18 percent. They also reduced the incidence of cork spot and alfalfa greening.

"Controlling bitter pit disorder in apples is a major part of our program here in Washington," says Fred Valentine. "If we didn't spray calcium on our apple trees, we'd have a cull rate close to 50 percent on some of our newer varieties, like Braeburn." Valentine is production manager for Dole Fruit in Wenatchee, Washington.

"Bitter pit was first recognized about 100 years ago," says former ARS plant physiologist J. Thomas Raese, who is now retired.

"When trees undergo stresses, such as excessively cold or hot weather, they sacrifice the current crop by developing calcium-deficient fruit and evidently relocating some of the calcium contained in the fruit

BRIAN PRECHTEL (K7598-18)



Plant physiologist Tom Raese checks by hand the firmness of a d'Anjou pear sprayed with calcium.

back into trees. This relocated calcium is enough to pull trees through stress periods.

"Unfortunately, the trees do not replenish calcium to the fruit, and calcium-related fruit disorders result," says Raese, who pioneered this research on apples and pears. He also showed that calcium treatments were frequently associated with increased cold hardiness in pear trees.

"I liken this to a 50-year war," says George Ing, manager of the Washington Tree Fruit Research Commission in Yakima.

"While we've conducted lots of research, we still do not know exactly when to apply the calcium. We are applying it by calendar dates. We need to look at fine-tuning applications and learning if we can modify trees so that they move calcium back to fruit after stress. But that's a long way off," says Ing.

The commission has helped fund the ARS research.

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Horticulturist Stephen Drake uses a texture analyzer to precisely measure the firmness of a d'Anjou pear.

Despite the need for more study, Ing says knowledge gained so far has certainly helped the fruit industry and benefited rural areas of the state. When sprays were first tested, some caused more damage than the diseases themselves.

"I strongly believe in using calcium spray on my apples," says Gary Vaughn, a grower in East Wenatchee, Washington. "I have trophies to prove my apples are better than those from neighbors who do not spray."

Vaughn says the sprays have cut his cullage rate considerably, and he gets much higher quality fruit coming out of storage, ready for market.

"In most instances, in addition to disease control, calcium applications during the growing season improve the firmness, total acidity, and juiciness ratings of apples," says ARS horticulturist Stephen R. Drake. He is following up on calcium spray research begun about 18 years ago at the Tree Fruit Research Laboratory at Wenatchee by Raese and Edward A. Stahly, another plant physiologist who is now retired from ARS.

Several different formulations of calcium are available to orchardists, with label recommendations specifically for various fruit crops.

On apples, calcium chloride is applied at 3-week intervals, June through August, at the rate of 3 pounds per 100 gallons of water. On pears, the rate is 1-1/2 pounds per 100 gallons. Larger trees require more spray per acre for adequate coverage.—By **Dennis Senft**, ARS.

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